

Claims:

1. A filter comprising a metal reagent which binds with a gaseous component of a gas stream to remove said gaseous component from said gas stream.
- 5 2. The filter according to claim 1, wherein the filter comprises a cigarette filter attached to a tobacco rod by tipping paper or the metal reagent is incorporated in one or more cigarette filter parts selected from the group consisting of tipping paper, shaped paper insert, a plug, a space, or a free-flow sleeve.
3. The filter according to claim 1, wherein the metal reagent  
10 selectively binds to unsaturated hydrocarbons in the gas stream.
4. The filter according to claim 1, wherein the metal reagent comprises nanometer or micrometer size clusters of a transition metal or alloy containing a transition metal or a transitional metal salt.
5. The filter according to claim 1, wherein the gaseous component to  
15 be removed from said gas stream is 1,3-butadiene, isoprene and/or toluene.
6. The filter according to claim 4, wherein said metal reagent is incorporated in cigarette filter paper located within a free-flow filter, the filter paper optionally having a three-dimensional shape and/or the filter paper being a liner on the interior of a hollow tubular element.
- 20 7. The filter according to claim 1, wherein said metal reagent is incorporated with cellulose acetate fibers and/or polypropylene fibers forming a plug or a free-flow filter element.

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8. The filter according to claim 4, wherein said metal reagent is incorporated in or on a support material

9. The filter according to claim 8, wherein said support material comprises silica gel, porous carbon or a zeolite.

5 10. The filter according to claim 4, wherein said transition metal includes iron and/or titanium.

11. The filter according to claim 1, wherein said metal reagent comprises nanometer or micrometer size clusters of an iron aluminide or a titanium aluminide.

10 12. The filter according to claim 1, wherein a metal atom of the metal reagent binds to a C-H bond and/or a C-C bond of the gaseous component.

13. A method of manufacturing a filter which is useful for removing a gaseous component of a gas stream, comprising steps of:

15 incorporating a metal reagent in a filter, the metal reagent being effective to bind with a gaseous component of a gas stream sufficiently to selectively remove the gaseous component from the gas stream.

20 14. The method according to claim 13, further comprising attaching the filter to a tobacco rod with tipping paper or the metal reagent is incorporated in one or more cigarette filter parts selected from the group consisting of tipping paper, shaped paper insert, a plug, a space, or a free-flow sleeve.

15. The method according to claim 14, further comprising a step of attaching the filter paper within a free-flow filter of a cigarette such as by forming

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said filter paper into a three-dimensional shape or attaching said filter paper as a liner on the interior of a hollow tubular element or combining said metal reagent with fibers and forming a filter element from said metal reagent and fibers or combining said metal reagent with cellulose and/or polypropylene fibers and forming a plug or free-flow filter element or incorporating said metal reagent in a cavity of said filter.

16. The method according to claim 13, wherein the metal reagent is effective for removing unsaturated hydrocarbons including 1,3-butadiene, isoprene and/or toluene from the gas stream.

17. The method according to claim 13, wherein the metal reagent comprises nanometer or micrometer size clusters of a transition metal or alloy containing a transition metal or a transitional metal salt.

18. The method according to claim 17, further comprising a step of loading said metal reagent in or on a support material forming a filter element of the filter.

19. The method according to claim 18, wherein the support material comprises silica gel, porous carbon or a zeolite.

20. A method of removing a gaseous component from a gas stream, comprising passing the gas stream in contact with a filter comprising a metal reagent which binds with a gaseous component of the gas stream and removes said gaseous component from the gas stream.

21. The method according to claim 20, further comprising steps of forming the gas stream by burning tobacco and directing tobacco smoke through

the filter such that the component of the gas stream to be removed is brought into contact with the metal reagent and prevented from reentering the gas stream.

22. The method according to claim 21, wherein the metal reagent is incorporated in one or more cigarette filter parts selected from the group consisting of filter paper, tipping paper, shaped paper insert, a plug, a space, or a free-flow sleeve, the tobacco smoke being passed through the one or more filter parts.

23. The method according to claim 20, wherein the metal reagent is effective to selectively remove unsaturated hydrocarbons present in the gas stream.

24. The method according to claim 20, wherein the metal reagent comprises nanometer or micrometer size clusters of a transition metal or alloy containing a transition metal or a transitional metal salt.

25. The method according to claim 20, wherein the filter removes 1,3-butadiene, isoprene and/or toluene from the gas stream.

26. The method according to claim 20, wherein the metal reagent is incorporated in or on a support material selected from the group consisting of silica gel, porous carbon or a zeolite.

27. The method according to claim 26, wherein said silica gel has an average particle diameter of at least 10  $\mu\text{m}$  or said silica gel is in the form of particles having a mesh size of at least 60 and the gas stream is passed through a mass of particles of said silica gel.

28. The method according to claim 26, wherein said silica gel is incorporated with cellulose acetate fibers and/or polypropylene fibers and the gas stream is a smoke stream from a burning cigarette.

29. The method according to claim 20, wherein a metal atom of the  
5 metal reagent binds to a C-H bond and/or a C-C bond of the gaseous component.

30. The filter according to Claim 1, wherein the metal reagent is a non-oxide metal reagent or a crystalline metal reagent.

31. The method according to Claim 13, wherein the metal reagent is a non-oxide metal reagent or a crystalline metal reagent.

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